



28) When the external pressure is 101.3 kPa torr, water will boil at what temperature?

- A) 12.8 °C. B) 14.5 °C. C) 100 °C. D) 18 °C.

29) The phase change represented by the equation $I_2(s) \rightarrow I_2(g)$ is called:

- A) Sublimation. B) Condensation. C) Melting. D) Boiling.

30) Solid X is placed in contact with solid Y. Heat will flow spontaneously from X to Y when:

- A) X is 20°C and Y is 20°C. B) X is 10°C and Y is 5°C.
C) X is -25°C and Y is -10°C. D) X is 25°C and Y is 30°C.

31) What is the total number of joules of heat energy absorbed by 15 grams of water when it is heated from 30°C to 40°C?

- A) 10 J. B) 63 J. C) 150 J. D) 630 J.

32) Which substance cannot be decomposed into simpler substances?

- A) Ammonia. B) Aluminum. C) Methane. D) Methanol.

33) Under the same conditions of temperature and pressure, a liquid differs from a gas because the particles of the liquid:

- A) Are in constant straight-line motion.
B) Take the shape of the container they occupy.
C) Have no regular arrangement.
D) Have stronger forces of attraction between them.



- 43) What is the pH of a solution with a hydronium ion concentration of 0.01 mole per liter?
- A) 1. B) 2. C) 10. D) 14.
- 44) Which 0.1 M solution will turn phenolphthalein pink?
- A) $\text{HBr}_{(aq)}$ B) $\text{CO}_{2(aq)}$ C) $\text{LiOH}_{(aq)}$ D) $\text{CH}_3\text{COH}_{(aq)}$
- 45) As the hydrogen ion concentration of an aqueous solution increases, the hydroxide ion concentration of this solution will:
- A) Decreases. B) Increases. C) Remains the same.
- 46) Which type of reaction is occurring when a metal undergoes corrosion?
- A) Oxidation- Reduction. B) Neutralization.
C) Polymerization. D) Saponification.
- 47) What is the oxidation number of carbon in NaHCO_3 ?
- A) +6. B) +2. C) -4. D) +4.
- 48) Given the reaction: $2\text{Li}_{(s)} + \text{Cl}_{2(g)} \rightarrow 2\text{LiCl}_{(s)}$
As the reaction takes place, the $\text{Cl}_{2(g)}$ will:
- A) Gain electrons. B) Lose electrons. C) Gain protons. D) Los



7) Which compound forms a colored aqueous solution?

A) CaCl_2

☒ B) CrCl_3

C) NaOH

D) KBr

8) Which of the following elements has the smallest atomic radius?

A) Nickel

B) Cobalt

C) Calcium

☒ D) Potassium

9) Which halogens are gases at STP?

A) Chlorine & Fluorine

B) Chlorine & Bromine

C) Iodine & Fluorine

D) Iodine & Bromine

10) Which set of elements contains a metalloid?

A) (K, Mn, As, Ar)

☒ B) (Li, Mg, Ca, Kr)

C) (Ba, Ag, Sn, Xe)

D) (Fr, F, Cl)

11) As atoms of elements in Group 16 are considered in order from top to bottom, the electro-negativity of each successive element:

A) Decreases

☒ B) Increases

C) Remains the same

12) An atom of which of the following elements has the greatest ability to attract electrons?

A) Silicon

B) sulfur

C) Nitrogen

☒ D) Chlorine

13) Which metal is obtained commercially by the electrolysis of salt?

☒ A) Zn

B) K

C) Fe

D) Ag



- 34) The volume of a given mass of an ideal gas at constant pressure is:
- A) Directly proportional to the Kelvin temperature.
 - B) Directly proportional to the Celsius temperature.
 - C) Inversely proportional to the Kelvin temperature.
 - D) Inversely proportional to the Celsius temperature.
- 35) How are the boiling and freezing points of a sample of water affected when salt is dissolved in the water?
- ☒ A) The boiling point decreases and the freezing point decreases.
 - B) The boiling point decreases and the freezing point increases.
 - C) The boiling point increases and the freezing point decreases.
 - D) The boiling point increases and the freezing point increases.
- 36) The heat of fusion of a compound is 30 joules per gram. What is the total number of joules of heat that must be absorbed by a 15.0 gram sample to change the compound from a solid to a liquid at its melting point?
- A) 15 Cal. ☒ B) 45 Cal. C) 15 Cal. D) 450 Cal.
- 37) Under which conditions are gases most soluble in water?
- ☒ A) High pressure and high temperature.
 - B) High pressure and low temperature.
 - C) Low pressure and high temperature.
 - D) Low pressure and low temperature.



21) What is the percent by mass of water in the hydrate $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ (formula mass = 286)?

- A) 6.89 % B) 14.5 % C) 26.1 % D) 62.9 %

22) What is the molarity of a KF (aq) solution containing 116 grams of KF in 1.00 liter of solution?

- A) 1 M B) 2 M C) 3 M D) 4 M

23) What is the empirical formula of a compound that contains 85% Ag and 15% F by mass?

- A) AgF B) Ag_2F C) AgF_2 D) Ag_2F_2

24) Which formula represents a molecular substance?

- A) CaO B) CO C) Li_2O D) Al_2O_3

25) Which substance is an example of a network solid?

- A) Nitrogen Dioxide. B) Sulfur Dioxide. C) Carbon Dioxide. D) Silicon Dioxide

26) A strontium atom differs from a strontium ion in that the atom has a greater

- A) No. of electrons. B) No. of protons. C) Atomic number. D) Mass number

27) Which gas is monatomic at STP?

- A) Chlorine. B) Fluorine. C) Neon. D) Nitrogen.



- 14) Which of the following is a binary compound?
A) Hydrogen Sulfide. B) Hydrogen Sulfate.
C) Ammonium Sulfide. D) Ammonium Sulfate.
- 15) What is the empirical formula of the compound whose molecular formula is P_4O_{10} ?
A) PO . B) PO_2 . C) P_2O_5 . D) P_8O_{20} .
- 16) Which is the correct formula for nitrogen (1) oxide?
A) NO . B) N_2O . C) NO_2 . D) N_2O_3 .
- 17) What is the gram formula mass of K_2CO_3 ?
A) 138 g. B) 106 g. C) 99 g. D) 67 g.
- 18) What is the percent by mass of oxygen in magnesium oxide, MgO ?
A) 20 %. B) 40 %. C) 50 %. D) 60 %.
- 19) What is the total number of moles of hydrogen gas contained in 9.03×10^2 ?
A) 1.5 moles. B) 2 moles. C) 6.02 moles. D) 9.03 moles.
- 20) What is the total number of moles of H_2SO_4 needed to prepare 5.0 liters of 2.0 M solution of H_2SO_4 ?
A) 2.5. B) 5. C) 10. D) 20.

Question One: Multiple Choices:

1) Compared to the charge and mass of a proton, an electron has:

- A) The same charge and a smaller mass.
- B) The same charge and the same mass.
- ☒ C) An opposite charge and a smaller mass.
- D) An opposite charge and the same mass.

2) A proton has approximately the same mass as:

- A) A Neutron.
- ☒ B) An Alpha Particle.
- C) A Beta Particle.
- D) An Electron.

3) A neutron has approximately the same mass as a:

- A) An Alpha Particle.
- ☒ B) A Beta particle.
- C) An Electron.
- D) A Proton.

4) Which element's ionic radius is smaller than its atomic radius?

- A) Neon.
- B) Nitrogen.
- C) Sodium.
- ☒ D) Sulfur.

5) An ion with 5 protons, 6 neutrons, and a charge of 3+ has an atomic number of:

- A) 5.
- B) 6.
- ☒ C) 11.
- D) 17.

6) Which three groups of the Periodic Table contain the most elements classified as metalloids (semimetals)?

- A) (1, 2 & 13).
- B) (2, 13 & 14).
- ☒ C) (14, 15 & 16).
- D) (16, 17 & 18).



- 38) Which statement explains why the speed of some chemical reactions is increased when the surface area of the reactant is increased?
- A) This change increases the density of the reactant particles.
 - ☒ B) This change increases the concentration of the reactant.
 - C) This change exposes more reactant particles to a possible collision.
 - D) This change alters the electrical conductivity of the reactant particles.
- 39) In a chemical reaction, a catalyst changes the:
- ☒ A) Potential energy of the products.
 - B) Potential energy of the reactants.
 - C) Heat of reaction.
 - D) Activation energy.
- 40) Which procedure will increase the solubility of KCl in water?
- ☒ A) Stirring the solute and solvent mixture.
 - B) Increasing the surface area of the solute.
 - C) Raising the temperature of the solvent.
 - D) Increasing the pressure on the surface of the solvent.
- 41) Which substance can be classified as an Arrhenius acid?
- ☒ A) HCl.
 - B) NaCl.
 - C) LiOH.
 - D) KOH.
- 42) An acidic solution could have a pH of:
- ☒ A) 7.
 - B) 10.
 - ☒ C) 3.
 - D) 14.